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Canadian Science Advisory Secretariat
Gulf Region | Science Response 2017/012

SPAWNER ABUNDANCE AND BIOLOGICAL CHARACTERISTICS OF STRIPED BASS (*MORONE SAXATILIS*) IN THE SOUTHERN GULF OF ST. LAWRENCE IN 2016

Context

The Striped Bass population of the southern Gulf of St. Lawrence has increased in abundance from less than 5,000 spawners in the late 1990s to as many as 301,000 spawners in 2015. Due to conservation concerns, the commercial fishery closed in 1996 and the recreational and aboriginal fisheries for Striped Bass were closed in 2000. A small number of food, social, and ceremonial (FSC) fisheries were reinstated in 2012 and allocations of Striped Bass to aboriginal groups have gradually increased since then. The recreational fishery reopened in 2013. With continued requests for additional access to southern Gulf Striped Bass, Fisheries and Oceans Canada (DFO) Gulf Ecosystems and Fisheries Management branch requested an update on the size of the spawning stock and information on biological characteristics to 2016. This Science Response Report results from the Science Response Process of February 17, 2017 on the update of indicators of the Striped Bass (*Morone saxatilis*) population of the southern Gulf of St. Lawrence, DFO Gulf Region, in 2016.

Background

Southern Gulf of St. Lawrence Striped Bass (*Morone saxatilis*) are distributed in near shore waters and estuaries from the eastern tip of the Gaspe Peninsula in Quebec to the northern tip of Cape Breton Island, Nova Scotia. The only confirmed location where southern Gulf of St. Lawrence Striped Bass spawn every year is the Northwest Miramichi River; consequently, this was the location chosen to develop annual abundance indices. Since 1993, monitoring of bycatch in the commercial gaspereau trapnets of the Miramichi River has been the principal source of information for Striped Bass spawning population numbers for the southern Gulf. The spawner abundance was usually estimated from mark and recapture experiments in which adult Striped Bass were tagged early in May and monitored throughout June as they were captured and released as bycatch in the gaspereau fishery of the Northwest Miramichi Estuary (Bradford and Chaput 1996; Douglas and Chaput 2011). Catch per unit effort (CPUE) from this fishery has been used as an index of abundance for Striped Bass since 1993 (Douglas and Chaput 2011). Selected biological characteristics (e.g. fork length, age, sex, and spawning stage) were recorded from fish captured in commercial gaspereau trapnets (May) and at trapnet monitoring facilities operated by DFO Science (May-October).

Analysis and Response

Spawner abundance

For the purpose of the 2016 Striped Bass assessment program, one gaspereau trapnet was operated in the Northwest Miramichi River between May 5 and June 3 before the commercial

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gaspereau season began. In 2016, the regular gaspereau season in the Northwest Miramichi was from 6 pm on 1 June to 6 pm on 29 June. One commercial trap was first set on 1 June with the first catches to monitor on 4 June. Gaspereau catches were monitored regularly throughout the season with 59 of a possible 145 (41%) trapnet hauls sampled for Striped Bass bycatch.

The sampling period considered appropriate for estimating abundance of Striped Bass spawners occurred between 4 June and 14 June. Similar to previous years, the bycatch of Striped Bass was highest early in the season and decreased to low levels by mid-June (Appendix 1). The first report of spawning Striped Bass in the Cassilis area (Northwest Miramichi) was on 23 May which coincided with increasing water temperatures above 15ºC.

The Bayesian hierarchical model used in previous Striped Bass assessments was applied to the 2016 CPUE information from the gaspereau fishery (Chaput and Douglas 2011). Similar to 2014 and 2015, an adjustment to the model was made to account for the observed behaviour of Striped Bass carrying internal acoustic tags (DFO 2015; DFO 2016). The movements of 69 Striped Bass carrying acoustic transmitters were monitored with receiver arrays anchored throughout the Miramichi during May and June 2016. The tracking of acoustically tagged Striped Bass provided information on the daily distribution of spawners on the spawning grounds and therefore available to be captured in the gaspereau trapnets of the Northwest Miramichi.

To estimate spawner abundance in 2016, the catch rates on individual sampling dates were assumed to be proportional to the spawner abundance on the spawning grounds in the Northwest Miramichi. The abundance on the spawning grounds for those dates was estimated as the product of the total spawner abundance at the beginning of the spawning period and the proportion of the acoustically tagged bass on the spawning grounds. Based on acoustically tagged bass, the proportions declined from 10% on 4 June to 4% on 14 June. The median of estimated spawner abundance in 2016 was 318,000 with very wide confidence intervals (5^{th} and 95^{th} percentiles of 154,000 and 629,000) (Fig. 1).

Catches of Striped Bass at DFO index trapnets at Millerton on the Southwest Miramichi River and at Cassilis on the Northwest Miramichi River provide fishery-independent indices of the southern Gulf Striped Bass population. In 2016, the trapnet at Cassilis operated between 16 May and 21 October while the trapnet at Millerton operated between 31 May and 21 October. Catches of Striped Bass at these facilities in 2016 were the highest of the May/June time series (n = 8,395) and the September/October time series (n = 12,663) (Appendix 2). The high autumn catch in 2016 was largely the result of a single day's catch at Millerton on October 17 when striped bass numbers were conservatively estimated at 6,000.

The Recovery Potential Assessment (RPA) of Striped Bass, which was conducted to support the Species at Risk Act listing decision process, proposed a recovery limit and a recovery target for the southern Gulf Striped Bass spawning population in the Northwest Miramichi estuary (DFO 2006; Douglas et al. 2006). The proposed recovery limit was at least 21,600 spawners in five of six consecutive years. Once that was achieved, then the proposed recovery target for considering fisheries access was ≥ 31,200 spawners in three of six consecutive years. It was also suggested that the 5^{th} percentile of the spawner abundance estimate be used to assess status relative to these recovery objectives (DFO 2006; Douglas et al. 2006). The abundance of Striped Bass spawners in the Northwest Miramichi in 2016 was sufficient to meet the RPA recovery limit and recovery target for the sixth consecutive year (2011 to 2016) (Fig. 1).

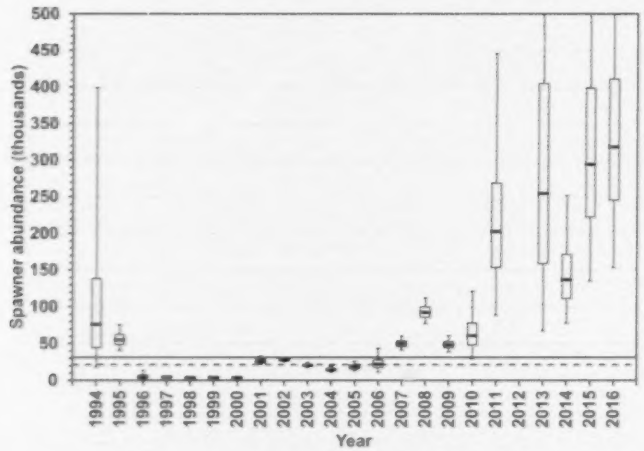

Figure 1. Estimated abundances of adult Striped Bass spawners in the Northwest Miramichi estuary between 1994 and 2016. The estimate for 2010 is considered to be an underestimate due to the earlier timing of the spawning events (Douglas and Chaput 2011). There is no estimate for 2012 because spawning was very early and bass left the sampling area prior to monitoring activities (DFO 2013). Box plots are interpreted as follows: dash is the median, boxes are the interquartile range, and the vertical dashes are the 5th to 95th percentile ranges. The solid and dashed horizontal lines show the recovery objectives defined in the Recovery Potential Assessment in support of the Species at Risk Act listing decision process (DFO 2006).

Biological characteristics

The mean fork length (FL) of adult Striped Bass (assumed to be fish > 30 cm) measured in May and June 2016 was 46.7 cm (range 30.4 to 91.4 cm; n = 6,419). Sixty percent of striped bass sampled had fork lengths between 30 and 45 cm, 31% between 46 and 61 cm (equivalent to the retention slot regulation of 50 to 65 cm TL), and 9% were 60 cm or greater.

For adult Striped Bass sampled during the months of September and October 2016, the mean fork length was 50.8 cm (range 32.8 to 85.0; n=678). Thirty-three percent of striped bass sampled had fork lengths between 30 and 45 cm, 52% between 46 and 61 cm (equivalent to the retention slot regulation of 50 to 65 cm TL), and 16% were 60 cm or greater.

The dominant mode of fish with fork lengths between 30 and 40 cm observed in the spring of 2015 was apparent again in the spring of 2016 with fish between 35 and 45 cm and again in the fall 2016 with fish between 40 and 50 cm FL (Fig. 2).

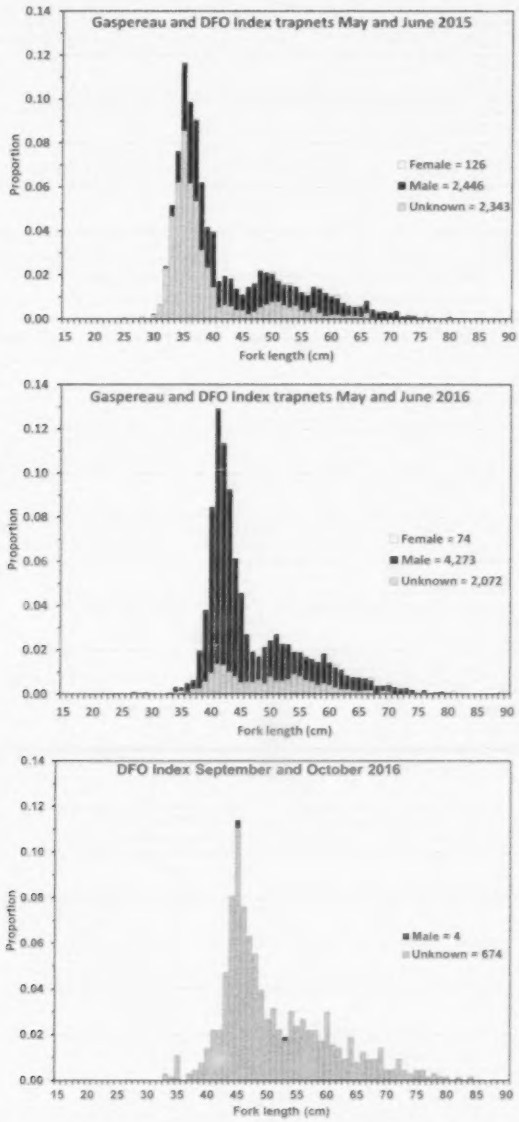
Gaspereau and DFO Index trapnets May and June 2015
Female = 126
Male = 2,446
Unknown = 2,343
Gaspereau and DFO Index trapnets May and June 2016
Female = 74
Male = 4,273
Unknown = 2,072
DFO Index September and October 2016
Male = 4
Unknown = 674
Proportion
Fork length (cm)

Figure 2. Fork length distributions of Striped Bass by sex and season. The upper and middle panels summarize the frequency by fork length of Striped Bass sampled in the gaspereau trapnet in the Northwest Miramichi and in DFO index trapnets in May and June 2015 and 2016, respectively. The lower panel summarizes the frequency by fork length of Striped Bass sampled at DFO index trapnets in September and October 2016.

Conclusions

The monitoring of the movements of Striped Bass onto and away from the spawning grounds using acoustic telemetry provided a method of estimating the proportion of spawners that were available to capture in the bycatch monitoring program of the gaspereau fishery. Spawner abundance in 2016 was estimated at 318,000 fish but with very large uncertainty (95% C.I. 154,000 to 629,000). The estimate in 2016 replaces the previous high estimate of the time

series recorded in 2015 with similarly very high uncertainty (median 301,000; 95% C.I. 151,400 to 696,900). The most abundant size group of Striped Bass in the spring of 2016 measured between 30 and 45 cm FL, representing 60% of bass sampled. Striped bass within the recreational fishery retention size slot of 50 to 65 cm TL increased from 31% of bass sampled in the spring to 52% of bass sampled in the fall. The Recovery Potential Assessment recovery objectives for the southern Gulf Striped Bass population were met for the sixth consecutive year in 2016.

Contributors

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Doug Bliss
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Sources of information

This Science Response Report results from the Science Response Process of 17 February 2017 on the update of indicators of the Striped Bass (*Morone saxatilis*) population of the southern Gulf of St. Lawrence, DFO Gulf Region, in 2016. No additional publications from this process will be produced.

Bradford, R.G. and Chaput, G. 1996. The status of striped bass (*Morone saxatilis*) in the southern Gulf of St. Lawrence. DFO Atl. Fish. Res. Doc. 96/62: 36 p.

Chaput, G. and Douglas, S. 2011. Hierarchical Bayesian model to estimate the spawning stock of Striped Bass (*Morone saxatilis*) in the Northwest Miramichi River, 1994 to 2010. DFO Can. Sci. Advis. Sec. Res. Doc. 2011/081. iv + 51 p.

DFO. 2006. Recovery assessment report for the St. Lawrence estuary, southern Gulf of St. Lawrence and Bay of Fundy striped bass (*Morone saxatilis*) populations. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2006/053.

DFO. 2013. Update to 2012 on spawner abundance and biological characteristics for striped bass (*Morone saxatilis*) in the southern Gulf of St. Lawrence. DFO Can. Sci. Advis. Sec. Sci. Resp. 2013/10.

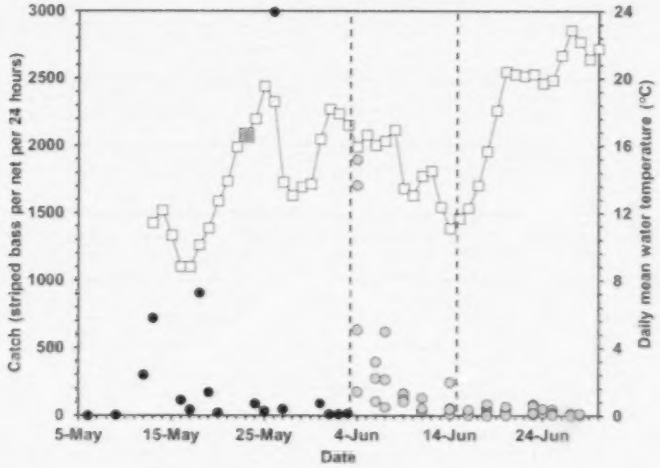
DFO. 2015. Recreational fishery catches, spawner abundance, and biological characteristics of Striped Bass (*Morone saxatilis*) in the southern Gulf of St. Lawrence in 2014. DFO Can. Sci. Advis. Sec. Sci. Resp. 2015/011.

DFO. 2016. Spawner abundance and biological characteristics of Striped Bass (*Morone saxatilis*) in the southern Gulf of St. Lawrence in 2015. DFO Can. Sci. Advis. Sec. Sci. Resp. 2016/017.

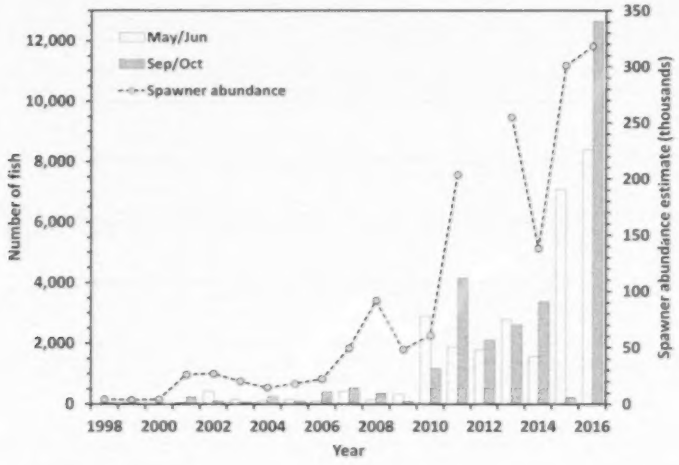
Douglas, S.G. and Chaput, G. 2011. Assessment and status of Striped Bass (*Morone saxatilis*) in the Southern Gulf of St. Lawrence, 2006 to 2010. DFO Can. Sci. Advis. Sec. Res. Doc. 2011/097. iv + 22 p.

Douglas, S.G., Chaput, G., and Caissie, D. 2006. Assessment of status and recovery potential for striped bass (*Morone saxatilis*) in the southern Gulf of St. Lawrence. DFO Can. Sci. Advis. Sec. Res. Doc. 2006/041: viii + 95 p.

Appendices



Appendix 1. The number of Striped Bass captured per net per day in a single trapnet used before the opening (black circles) and during (grey circles) the commercial gaspereau fishery of the Northwest Miramichi estuary in 2016. Vertical hatch lines encompass the data and the period which were used in the CPUE analyses. Squares show the mean daily water temperature and the red square represents the temperature on May 23, the date of the initial observation of Striped Bass spawning in the upper Northwest Miramichi estuary in 2016.



Appendix 2. The combined number of Striped Bass captured in the DFO index trapnets at Cassilis on the Northwest Miramichi River and at Millerton on the Southwest Miramichi River during the spring (May/June) and autumn (Sept. / Oct.) from 1998 to 2016. The median estimates of spawner abundance are also shown for comparison.

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MPO. 2017. Abondance de reproducteurs et caractéristiques biologiques du bar rayé (Morone saxatilis) du sud du golfe du Saint-Laurent en 2016. Secr. can. de consult. sci. du MPO, Rép. des Sci. 2017/012.